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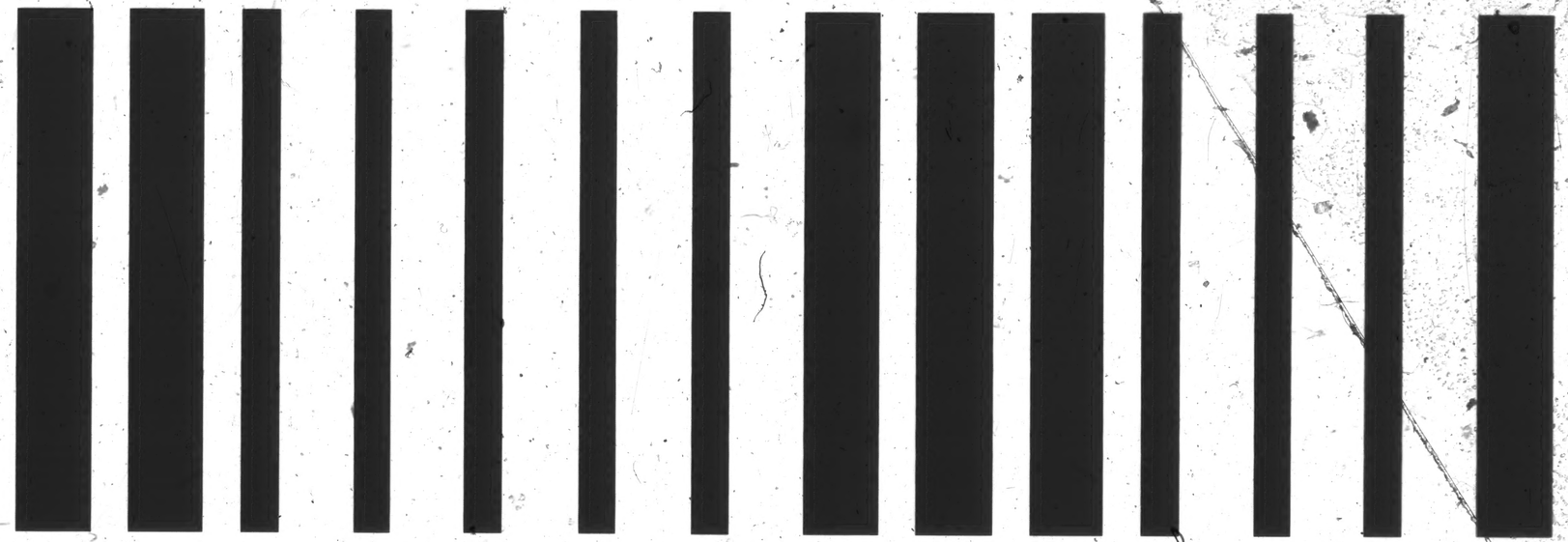

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Typical Report Citation and Abstract

❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
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8. Abstract Author
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 487)

MARCH 22, 1999

51 LIFE SCIENCES (GENERAL)

19990019291 Queens Univ., Advisory Research Committee, Kingston, Ontario Canada
Modeling the C Economy of Anabaena Flos-Aquae
Turpin, David H., Queens Univ., Canada; Layzell, David B., Queens Univ., Canada; Elrifi, Ivor R., Queens Univ., Canada; Plant Physiology; 1985; ISSN 0032-0889; Volume 78, pp. 746-752; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Steady state cultures of Anabaenaflos-aquae were established over a wide range of phosphate-limited growth rates while N was supplied as either NH3, NO3(-), or N2 gas. At growth rates greater than 0.03 per hour, rates of gross and net carbon fixation were similar on all N sources. However, at lower growth rates (less than 0.03 per hour) in the NO3(-) and N2 cultures, gross photosynthesis greatly exceeded net photosynthesis. The increase in photosynthetic O2 evolution with growth rate was greatest when N requirements were met by NO3(-) and least when met by NH3. These results were combined with previously reported measurements of cellular chemical composition, N assimilation, and acetylene reduction to construct empirical models of carbon and energy flow for cultures grown at 30, 60, and 100% of their maximal growth rate on all N sources. The models suggested that over this growth range, 89 to 100% of photodriven electrons were allocated to biomass production in the NH3 cells, whereas only 49 to 74% and 54 to 90% were partitioned to biomass in the NO3(-)- and N2-grown cells, respectively. The models were used to estimate the relative contribution of active, maintenance, and establishment costs associated with NO3(-) and N2 assimilation over the entire range of growth rates. The models showed that the relative contribution of the component costs of N assimilation were growth rate dependent. At higher growth rates, the major costs for NO3(-) assimilation were the active costs, while in N2-fixing cultures the major energetic requirements were those associated with heterocyst establishment and maintenance. It was concluded that compared with NO3(-) assimilation, N2 fixation was energetically unfavorable due to the costs of heterocyst establishment and maintenance, rather than the active costs of N2 assimilation.
Author
Nitrogen Compounds; Chemical Composition; Costs; Anabaena; Estimating; Nitrogen; Photosynthesis; Phosphates; Biochemistry

19990019297 Cornell Univ., Dept. of Mathematics, Ithaca, NY USA
Spatial Aspects of Interspecific Competition
Durrett, Rick, Cornell Univ., USA; Levin, Simon, Princeton Univ., USA; Theoretical Population Biology; Feb. 1998; ISSN 0040-5809; Volume 53, No. 1, pp. 30-43; In English
Contract(s)/Grant(s): N00014-92-J-1527; NAG5-6422; NSF DMS-93-01070; NSF BIR-94-23339; NAGw-4688; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Using several variants of a stochastic spatial model introduced by Silvertown et al., we investigate the effect of spatial distribution of individuals on the outcome of competition. First, we prove rigorously that if one species has a competitive advantage over each of the others, then eventually it takes over all the sites in the system. Second, we examine tradeoffs between competition and dispersal distance in a two-species system. Third, we consider a cyclic competitive relationship between three types. In this case, a nonspatial treatment leads to densities that follow neutrally stable cycles or even unstable spiral solutions, while a spatial model yields a stationary distribution with an interesting spatial structure.
Author
Spatial Distribution; Competition; Stability; Mathematical Models; Stochastic Processes

19990019801 Colorado Univ., BioServe Space Technologies, Boulder, CO USA
A Review of Plant Experiments Supported by the Astro/Plant Generic Bioprocessing Apparatus on MSL-1
Heyenga, A. G., Colorado Univ., USA; Stodieck, Louis S., Colorado Univ., USA; Hoehn, A., Colorado Univ., USA; Microgravity Science Laboratory (MSL-1); November 1998, pp. 2-7; In English; See also 19990019800; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The utilization of plant-based materials in modern human society is extensive and of considerable commercial value including the production of food, pharmaceutical, lumber, and paper products. The advent of space flight research and the means to cultivate plants in the near absence of gravity have provided a unique opportunity to expand our understanding of plant physiology, metabolism, and genetics and to develop new approaches to further utilize this resource. An area of specific commercial interest encompasses the prospect that microgravity may be used to alter and help elucidate the control mechanisms of certain plant metabolic pathways enabling the further genetic engineering and cultivation of plants with desired traits on Earth. Particular attention is being directed towards the study of the cell structural compound lignin. A potential decrease in the production of such a compound could result in a corresponding increase in the production of metabolically related compounds including lignans and neolignans that are of significant medicinal value. An alteration in metabolic flux may equally extend to an enhancement in the production of compounds arising from the valuable alkaloid and terpene pathways. Additional areas in which the absence of gravity may influence plant metabolism include the production and distribution of plant growth control factors such as auxins and in the production of ligand molecules involved in the recognition system of plant symbiotic associations with microorganisms. The latter process is of significant value to agriculture in such areas as nitrogen fixation. The implementation of the MSL-1 plant study conducted on the Shuttle mission STS-94 was directed towards establishing an initial experimental baseline in plant response and applying investigative techniques that include the use of radioisotopes and molecular markers. A number of plant species were cultivated for 16 days in the Astro/Plant Generic Bioprocessing Apparatus (Astro/PGBA) under defined environmental conditions. The principle areas of investigation involved an examination of (a) lignin and vinca alkaloid metabolism, (b) the response of an auxin inducible GH3 gene, and (c) the interactive association of wheat with Rhizobium bacteria.
Author
Radioactive Isotopes; Plants (Botany); Nitrogenation; Pharmacology; Genetic Engineering; Vegetation Growth; Microgravity; Genetics

19990020846 Toronto Univ., Dept. of Geology, Ontario Canada
Bacterial Mineral Precipitation and the Making of Microfossils
Ferris, F. G., Toronto Univ., Canada; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 12-13; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

An important prerequisite for the precipitation of minerals from aqueous solutions, even where bacteria are involved, is that a moderate degree of oversaturation must be achieved. This requirement is imposed thermodynamically by an activation energy barrier that constrains the spontaneous formation of insoluble precipitates from solution. Bacteria intervene in mineral precipitation reactions in two ways, either directly as catalysts of aqueous geochemical reactions or indirectly as chemically reactive solids. In the first case, bacterial metabolic activity is often significant and can trigger changes in solution chemistry that lead to oversaturation (e.g., through the production of reactive ligands like sulfide). This alone can induce mineral formation by lowering the activation energy barrier for homogenous (precipitation in solution) and heterogeneous (surface precipitation on foreign solids) nucleation reactions. The second case relates to the presence of reactive amphoteric sites on bacterial cells that facilitate sorption of dissolved mineral-forming elements, and foster heterogeneous surface precipitation reactions. Thus, minerals precipitated directly from solution as a result of bacterial metabolic activity can form on the inside, outside, or even some distance away from cells. Indirect chemical precipitation as a consequence of changing geochemical conditions is also possible and is accompanied by passive epicellular nucleation and crystal growth on the outside of living or dead bacterial cells, this is the most likely pathway leading toward preservation of structurally intact microfossils. In natural systems, however, direct and indirect bacterial mineral precipitation reactions may occur at the same time and are difficult to recognize as entirely separate processes. When bacteria are metabolically involved in mineral formation, biogenecity can sometimes be inferred from chemical (e.g., stable isotope) or mineralogical (e.g., magnetite produced by magnetotactic bacteria) data. On the other hand, microscopic techniques are useful in the assessment of cell-surface-mediated mineral precipitation providing that diligence is exercised to unequivocally establish the composite nature (i.e., mineralogical and bacterial) of the specimen.
Author
Bacteria; Chemical Reactions; Geochemistry; Microorganisms; Mineralogy; Fossils; Paleobiology

19990020849 Granada Univ., Faculta
Biomimetic but Abiotic Carbonates
Garcia-Ruiz, J. M., Granada Univ., S
Going?; 1998, pp. 16-17; In English;
Abstract Only; Abstract Only
The unambiguous detection of an
to reveal features of past life forms is a
few biomarkers used today (stromatoli
morphological recognition of living fo
principle supporting life detection usin
unable to produce neither shapes displ
mind, there is a substantial morpholog
complex shapes with noncrystallograp
precipitation. The most recent and con
Author
Exobiology; Carbonates; SNC Meteor

19990020856 Harvard Univ., Botanic
The Signature of Life: Is it Legible?
Knoll, A. H., Harvard Univ., USA; Wo
1998; 2p; In English; See also 199900
Abstract Only
Everyday experience suggests tha
however, because the biology most fam
culty in distinguishing biogenic from a
of physical processes, and it is likely th
tion, and catalytic properties - bore a c
Author
Chemical Composition; Organisms; M

19990020857 Institute of Space Resea
Martian Biogenic Activity: Looking
Ksanfomality, L. V., Institute of Space
Where are we Going?; 1998, pp. 26; In
fiche; Abstract Only; Abstract Only
A current program of investigation
matic hydrocarbons traces, C-isotopic
based on a hypothesis about a presence
is based on the contemporary existing
reactions, which were highly probable
tions occurred early in martian history,
form is amino-nucleic-acid life that use
viruses. It is known that viruses are able
for a long time until favorable conditio
the body of the ALH84001 meteorite a
Author
Amino Acids; Deoxyribonucleic Acid;
Environments

19990020862 Jet Propulsion Lab., Cal
Principal Component Analysis for B
McDonald, G. D., Jet Propulsion Lab.,
Inst. of Tech., USA; Workshop on the I
In English; See also 19990020835; No

d de Ciencias, Spain
: New Geochemical Markers for Primitive Environments
pain: Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we
See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche;

cient life is a crucial necessity in assessing the timing of life on Earth. Today, the strategy
lso of utmost importance in seeking out living beings on other planets. Among other very
e structures, autigenic minerals, biological degradation compounds, and isotopic analysis),
rms still plays a critical role in Precambrian micropaleontological studies. The underlying
g morphological and textural tools derived from the old idea that inorganic precipitates are
aying certain symmetry groups nor certain bizarre textural arrangements. In this frame of
ical difference between the inanimate and the animate worlds: it was thought that certain
hic symmetry were characteristic of life and would be impossible to obtain by inorganic
spicuous application of this "law" is the fossillike microstructures found in ALH-84001.

ites; Extraterrestrial Life; Biogeochemistry

al Museum, Cambridge, MA USA

orkshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?;
020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only;

t the gulf between biology and the physical world is conspicuous. This impression arises,
iliar to us is largely that of organisms found on distal branches of the tree of life. The diffi-
biogenic forms lies at the other end of the tree; life arose as the self-perpetuating product
at the characteristics of Earth's earliest organisms - their size, shape, molecular composi-
lose resemblance to products of the physical processes that gave rise to life.

Mars Environment; Mars Surface; Extraterrestrial Life; Microorganisms

arch, Moscow, USSR
for Viruses and DNA Traces Instead of Extant Bacteria Traces
Research, USSR; Workshop on the Issue Martian Meteorites: Where do we Stand and
English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Micro-

s of organic components in ALH 84001 meteorite findings includes a study of the polyaro-
analysis, a search for amino-acid traces, O-isotopic analysis, etc. All of these studies are
of martian prehistoric primitive life traces in the SNC meteorite from Mars. The hypothesis
otions of the origin of life that originated in natural fashion, through numberless chemical
under the conditions of young Earth. There are a number of proofs that these same condi-
which means life could have originated on Mars as well. The only known terrestrial life
s nucleic acids as an information system. Primitive life forms include both microbes and
to withstand much more severe conditions than bacteria. Their inactive forms may survive
ns occur again. Thus, it could make sense to look for viruses or even DNA traces both in
nd on Mars in future space missions.

Mars (Planet); SNC Meteorites; Viruses; Extraterrestrial Life; Exobiology; Planetary

ifornia Inst. of Tech., Pasadena, CA USA
iosignature Detection in Extraterrestrial Samples
California Inst. of Tech., USA; Storrie-Lombardi, M. C., Jet Propulsion Lab., California
ssue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 30-31;
Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Analysis of extraterrestrial samples for organic signatures of past or present life presents several problems. Chief among these is distinguishing bonafide extraterrestrial organic material from terrestrial contamination, either carried on a spacecraft or present in the terrestrial environment to which the sample is exposed. A related problem is separating biologically derived molecules from those produced by abiotic syntheses in the interstellar medium, on meteorite parent bodies, or in planetary atmospheres and oceans.
Author
Meteorites; Organic Materials; Principal Components Analysis; Signatures; SNC Meteorites; Extraterrestrial Life; Exobiology

19990020867 Stanford Univ., Dept. of Geological and Environmental Sciences, Stanford, CA USA
Recognizing Life and its Evolution Through Biomarkers
Moldowan, J. M., Stanford Univ., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 37-38; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
Biomarkers are molecular fossils found in sedimentary rocks and petroleum. Like fossils, they are recognized as remnants of enzyme-mediated biosynthesis dictated by genetic code. They cannot be confused with abiogenic molecules, because they are produced in abundances that far exceed their relative chemical stabilities.
Author
Biosynthesis; Fossils; Paleobiology; Microorganisms

19990020868 NASA Johnson Space Center, Houston, TX USA
Possible Microfossils (Warrawoona Group, Towers Formation, Australia, approximately 3.3 - 3.5 Ga)
Morris, P. A., Houston Univ., USA; Wentworth, S. J., Lockheed Martin Corp., USA; Allen, C. C., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 38-39; In English; See also 19990020835
Contract(s)/Grant(s): NAG9-980; NAG9-867; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
Early in the twentieth century there were reports of Archean stromatolite-like structures that were similar to organic rich stromatolites from the base of the Cambrian (600 m.y.). It was not until the latter half of this century that fossilized Archean-age (3.9-2.5 Ga) life forms were found in the Fig Tree Formation of South Africa and the Towers Formation of Australia. Some of the ancient stromatolites contained streaks and clots of kerogen, pyrite grains, remnants of microbial cells, and filaments that represented various stages of preservation, while others appeared to lack fossils. A set of physical criteria was established for evaluating the biogenicity of these Archean discoveries: (1) rocks of unquestionable Archean age; (2) microfossils indigenous to Archean sediments; and (3) microfossils occurring in clasts that are syngenetic with deposition of the sedimentary unit. In the case of bedded cherts, the fossils should predate the cherts; (4) the microfossils are biogenic; and (5) replicate sampling of the fossil-iferous outcrop firmly demonstrates the provenance of these microfossils. Sample 002 from the Precambrian Paleobiology Research Group (PPRG) was examined. This stromatolitic carbonaceous chert contains microbial remains that meet the established criteria [10]. Using a scanning electron microscope (SEM), we have analyzed the morphologies and chemistry of these possible microbial remains.
Author
Microorganisms; Paleobiology; Precambrian Period; Rocks

19990020871 Lockheed Martin Corp., Houston, TX USA
Reconnaissance Sampling of Airborne Molecular Organic Contamination in the Meteorite Curation Facility of Johnson Space Center
Schilling, E. A., Lockheed Martin Corp., USA; Schneider, M. N., Lockheed Martin Corp., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 40-42; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
Determining the extent of contamination of meteorites by terrestrial organic compounds has become a question of critical importance in the last several years. Contamination issues have been considered in the past and recognized as important, resulting in a good deal of study. However, more thoroughly understanding organic contamination issues is especially pressing when considering possible evidence of previous life on Mars and in future Mars sample-return missions.
Author
Contamination; Extraterrestrial Life; Mars (Planet); Mars Sample Return Missions; Meteorites; Organic Compounds; Exobiology; SNC Meteorites

19990020879 NASA Johnson Space Center, Houston, TX USA
Mineralization of Bacteria in Terrestrial Basaltic Rocks: Comparison With Possible Biogenic Features in Martian Meteorite Allan Hills 84001
Thomas-Keprta, K. L., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Wentworth, S. J., Lockheed Martin Corp., USA; Stevens, T. O., Battelle Pacific Northwest Labs., USA; Taunton, A. E., Arkansas Univ., USA; Allen, C. C., Lockheed Martin Corp., USA; Gibson, E. K., Jr., NASA Johnson Space Center, USA; Romanek, C. S., Savannah River Ecology Lab., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 53-54; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
The identification of biogenic features altered by diagenesis or mineralization is important in determining whether specific features in terrestrial rocks and in meteorites may have a biogenic origin. Unfortunately, few studies have addressed the formation of biogenic features in igneous rocks, which may be important to these phenomena, including the controversy over possible biogenic features in basaltic martian meteorite ALH84001. to explore the presence of biogenic features in igneous rocks, we examined microcosms growing in basaltic small-scale experimental growth chambers or microcosms. Microbial communities were harvested from aquifers of the Columbia River Basalt (CRB) group and grown in a microcosm containing unweathered basalt chips and groundwater (technique described in. These microcosms simulated natural growth conditions in the deep subsurface of the CRB, which should be a good terrestrial analog for any putative martian subsurface ecosystem that may have once included ALH84001. Here we present new size measurements and photomicrographs comparing the putative martian fossils to biogenic material in the CRB microcosms. The range of size and shapes of the biogenic features on the CRB microcosm chips overlaps with and is similar to those on ALH84001 chips. Although this present work does not provide evidence for the biogenicity of ALH84001 features, we believe that, based on criteria of size, shape, and general morphology, a biogenic interpretation for the ALH84001 features remains plausible.
Author
Bacteria; Basalt; Fossils; Geochemistry; Igneous Rocks; Mars (Planet); Microorganisms; Sediments; SNC Meteorites

19990020880 Lunar and Planetary Inst., Houston, TX USA
Ancient Martian Life in Allan Hills 84001? Status of Some Current Controversies
Treiman, A. H., Lunar and Planetary Inst., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 54-56; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
Four lines of evidence were taken to suggest that ALH84001 contained traces of ancient martian life preserved in its carbonate mineral masses: [1] abundance of organic compounds Polycyclic aromatic hydrocarbons (PAHs), [2] disequilibrium mineral assemblages, [3] morphology of submicrometer magnetite crystals, and [4] presence of objects comparable in size and shape to bacteria. This evidence is predicated on the carbonate globules having formed at temperatures conducive to life. Here, I review evidence on carbonate formation temperature, martian origin of organic compounds, and bacteria-shaped objects.
Author
Mars (Planet); Mineral Deposits; Exobiology; Extraterrestrial Life; Polycyclic Aromatic Hydrocarbons; Carbonates; Temperature; Magnetite; Bacteria

19990020885 NASA Johnson Space Center, Houston, TX USA
Terrestrial Biomarkers for Early Life on Earth as Analogs for Possible Martian Life Forms: Examples of Minerally Replaced Bacteria and Biofilms From the 3.5 - 3.3-Ga Barberton Greenstone Belt, South Africa
Westall, F., NASA Johnson Space Center, USA; McKay, D. S., NASA Johnson Space Center, USA; Gibson, E. K., NASA Johnson Space Center, USA; deWit, M. J., Cape Town Univ., South Africa; Dann, J., Cape Town Univ., South Africa; Gerneke, D., Cape Town Univ., South Africa; deRonde, C. E. J., Institute of Geological and Nuclear Sciences Ltd., New Zealand; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 61-62; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only
The search for extraterrestrial life and especially martian life hinges on a variety of methods used to identify vestiges of what we could recognize as life, including chemical signatures, morphological fossils, and biogenic precipitates. Although the possibility of extant life on Mars (subsurface) is being considered, most exploration efforts may be directed toward the search for fossil life. Geomorphological evidence points to a warmer and wetter Mars early on in its history, a scenario that encourages comparison with the early Earth. For this reason, study of the early terrestrial life forms and environment in which they lived may provide clues as to how to search for extinct martian life. As a contribution to the early Archean database of terrestrial microfossils, we present new data on morphological fossils from the 3.5-3.3-Ga Barberton greenstone belt (BGB), South Africa. This study under-

lines the variety of fossil types already present in some of the oldest, best-preserved terrestrial sediments, ranging from minerally replaced bacteria and bacteria molds of vaRious morphologies (coccoid, coccobacillus, bacillus) to minerally replaced biofilm. Biofilm or extracellular polymeric substance (EPS) is produced by bacteria and appears to be more readily fossilisable than bacteria themselves. The BGB fossils occur in shallow water to subaerial sediments interbedded with volcanic lavas, the whole being deposited on oceanic crust. Penecontemporaneous silicification of sediments and volcanics resulted in the chertification of the rocks, which were later subjected to low-grade metamorphism (lower greenschist).
Author
Bacteria; Extraterrestrial Life; Fossils; Lava; Structural Properties (Geology); Biogeochemistry; Colonies; Morphology

19990021038 San Diego Univ., Biology Dept., San Diego, CA USA
Investigations of the Effects of Altered Vestibular System Function on Hindlimb Anti-Gravity Muscles
Lowery, Mary Sue, San Diego Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche
Exposure to different gravitational environments, both the microgravity of spaceflight and the hypergravity of centrifugation, result in altered vestibulo-spinal function which can be reversed by reacclimation to earth gravity (2). Control of orientation, posture, and locomotion are functions of the vestibular system which are altered by changes in gravitational environment. Not only is the vestibular system involved with coordination and proprioception, but the gravity sensing portion of the vestibular system also plays a major role in maintaining muscle tone through projections to spinal cord motoneurons that control anti-gravity muscles. I have been involved with investigations of several aspects of the link between vestibular inputs and muscle morphology and function during my work with Dr. Nancy Daunton this summer and the previous summer. We have prepared a manuscript for submission (4) to Aviation, Space, and Environmental Medicine based on work that I performed last summer in Dr. Daunton's lab. Techniques developed for that project will be utilized in subsequent experiments begun in the summer of 1998. I have been involved with the development of a pilot project to test the effects of vestibular galvanic stimulation (VGS) on anti-gravity muscles and in another project testing the effects of the ototoxic drug streptomycin on the otolith-spinal reflex and anti-gravity muscle morphology.
Author
Research; Vestibules; Gravitation; Muscular Tonus; Muscular Function; Aerospace Medicine; Detection

19990021053 Washington Univ., School of Fisheries, Seattle, WA USA
Ecological Support of Larval Fish During Multigenerational Studies on Space Station
Taub, Frieda B., Washington Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche
Live, microscopic food is required by larval Zebrafish, Danio rerio, which are candidates for the Aquatic Habitat of the Space Station Biological Research Project (SSBRP). Zebrafish have proven to be convenient research animals, and their embryology and genetics are extensively documented. Their ability to mature at 3 months of age, and the transparent eggs which hatches in 2 days, are attractive attributes for space research. Among the goals of the SSBRP Aquatic Habitat is the ability to study three generations, with the objective of maintaining adults, their offspring, and the maintaining of these offspring through maturity and spawning. For Zebrafish, it is anticipated that sexually mature fish (PI) would be delivered to Space Station and spawned in space. The challenge would be it to provide appropriate microscopic foods for the offspring (FI), and 3 months later for the next generation (F2); if these were raised to maturity and bred, live foods would be required at approximately 6 months. In laboratories where Zebrafish are traditionally reared, the larval foods are the protozoan Parameciwn micromultinucleatwn and later brine shrimp Artemia nauplii. Under normal laboratory conditions, the rearing of these foods are relatively easy, although time consuming because of the food organisms must be separated from their rearing medium which is discarded. A freshwater food chain that would ensur-e healthy on- orbit research animals is needed. ne food chain should (a) be reared in conditions that are compatible with the larval fish (water chemistry, pH, temperature and light), (b) assist in maintaining water quality (by removing ammonia, nitrate, phosphate, carbon dioxide, and bacteria) and (c) be convenient for the space crew (minimize handling and waste production).
Derived from text
Ecology; Fishes; Embryology; Spaceborne Experiments; Artemia; Food Chain; Fresh Water; Organisms

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and anima

19990019298 Princeton Univ., Dept. of Ecology and Evolutionary Biology, NJ USA
From Individuals to Epidemics
nLevin, Simon A., Princeton Univ., USA; Durrett, R., Cornell Univ., USA; Phil. Trans R. Soc. Lond. B;
1615-1621; In English
Contract(s)/Grant(s): NAG5-6422; NSF DMS-93-01070; NSF BIR-94-23339; NAGw-4688; Copyright; A
Hardcopy, Microfiche
Heterogeneous mixing fundamentally changes the dynamics of infectious diseases; finding ways to inc
represents a critical challenge. Phenomenological approaches are deficient in their lack of attention to unde
vidual-based models, on the other hand, may obscure the essential interactions in a sea of detail. The challen
to bridge these levels of description, starting from individual-based models and deriving macroscopic descr
retain essential detail, and filter out the rest. In this paper, attempts to achieve this transformation are describe
where non-random mixing arises from the spatial localization of interactions. In general, the epidemic th
larger owing to spatial localization than for a homogeneous mixing population. An improved estimate of t
oped by the use of moment equations, and a simple estimate of the threshold in terms of a 'dyad heuristic'. Fo
in which local infection is not described by mass action, the connection with related partial differential equ
Author
Infectious Diseases; Heterogeneity; Heuristic Methods; Phenomenology

19990019377 NASA Langley Research Center, Hampton, VA USA
Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 485
Feb. 22, 1999; 23p; In English
Report No.(s): NASA/SP-1999-7011/SUPPL485; NAS 1.21:7011/SUPPL485; No Copyright; Avail: C
A01, Microfiche
This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliogr
(NASA/SP-1999-7011) lists reports, articles, and other documents recently announced in the NASA STI D
coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychologica
effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphe
space. References describing similar effects on biological organisms of lower order are also included. Such
tary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and pers
appropriate attention. Applied research receives the most emphasis, but references to fundamental studies
ciples related to experimental development also qualify for inclusion. Each entry in the publication consist
graphic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses
document availability information are included before the abstract section. Two indexes-subject and author
abstract section.
CASI
Aerospace Medicine; Bibliographies; Bioastronautics; Biological Effects; Exobiology; Indexes (Docume

19990019766 Johns Hopkins Univ., Baltimore, MD USA
Structural Indices of Stress Fracture Susceptibility in Female Military Recruits *Final Report, 22 Se*
Beck, Thomas J.; Oct. 1998; 32p; In English
Report No.(s): AD-A356178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Six hundred-ninety three female U.S. Marine Corps recruits were studied with anthropometry and dual
tiometry (DXA) scans of the thigh and lower leg prior to recruit training. A total of 37 stress fractures we
data were combined with an earlier study of 626 male Marine recruits including 38 stress fracture cases. Bon
cortical dimensions, thigh lean mass and muscle cross-sectional area were derived from DXA data. Measure
within sex between pooled fracture cases and controls. Fracture cases in both sexes were less physically fit,
muscles compared to controls. After correction for body size, section moduli (Z) and bone strength indices
were smaller in fracture cases of both sexes but patterns differed. Compared to controls, female cases had
lower BMD. Male cases had narrower bones but similar cortical thickness and BMD. In both sexes, difference
tal adaptation to training in fracture cases due to inadequate prior conditioning. Lower stress fracture rates

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MAN SYSTEM TECHNOLOGY AND LIFE SUPPORT

Civil Aeromedical Inst., Oklahoma City, OK USA

Garner, Robert P., Civil Aeromedical Inst., USA; Murphy, Richard L., Civil Aeromedical Inst., USA; Hudgins, Chad B., Civil Aeromedical Inst., USA; Mandella, Joseph G., Jr., Civil Aeromedical Inst., USA; Nov. 1998; 11p; In English

Subject Term Index

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13. ABSTRACT

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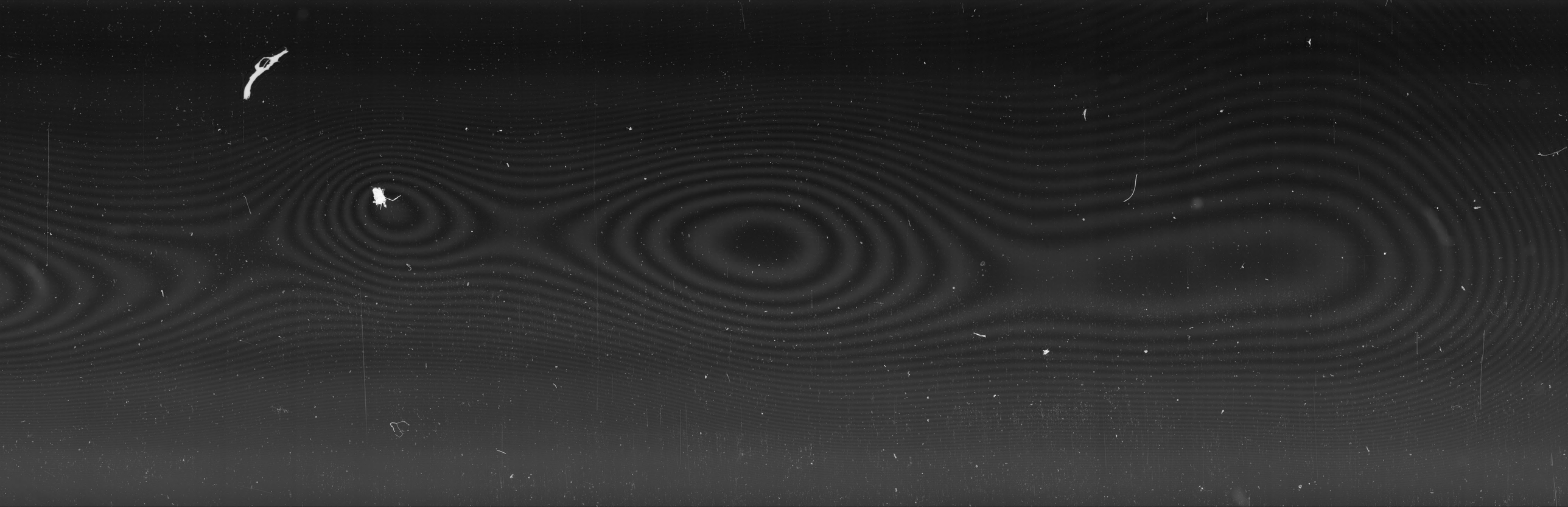
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